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(54) **ORGANIC LIGHT EMITTING DIODE DISPLAY AND MANUFACTURING METHOD THEREOF**

(71) Applicant: **Innolux Corporation**, Miao-Li County (TW)

(72) Inventors: **Hao-Jung Huang**, Miao-Li County (TW); **Kuang-Pin Chao**, Miao-Li County (TW); **Yang-Chen Chen**, Miao-Li County (TW)

(73) Assignee: **INNOLUX CORPORATION**, Miao-Li County (TW)

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(22) Filed: **Oct. 8, 2013**

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(30) **Foreign Application Priority Data**

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H01L 27/32 (2006.01)
H01L 51/56 (2006.01)

(52) **U.S. Cl.**

CPC ***H01L 51/5253*** (2013.01); ***H01L 27/32*** (2013.01); ***H01L 51/56*** (2013.01); ***H01L 51/5246*** (2013.01)

(58) **Field of Classification Search**

CPC ... H01L 51/52; H01L 51/524; H01L 51/5246; H01L 51/525; H01L 27/32; H01L 51/56
USPC 257/40, 81, 88; 438/25
See application file for complete search history.

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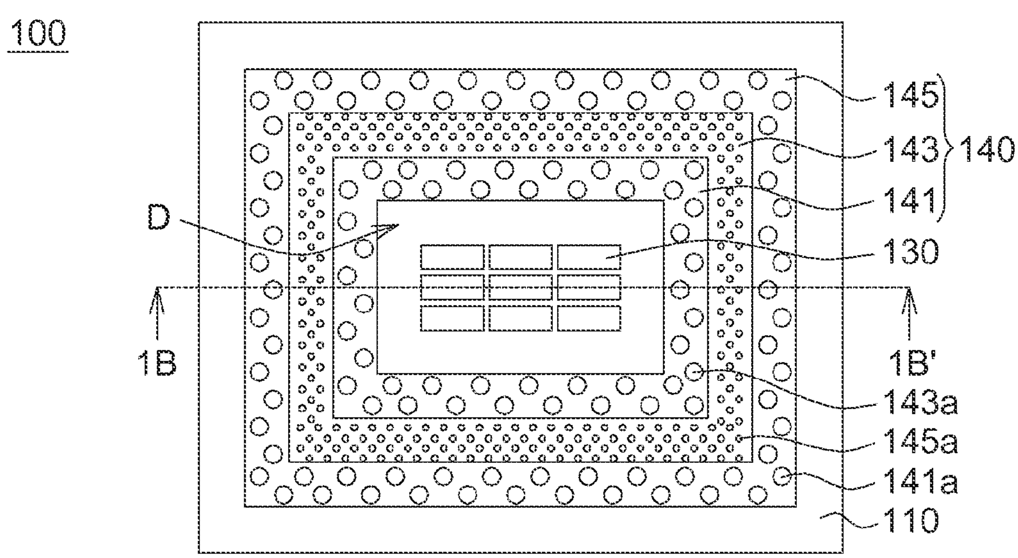
Primary Examiner — Allen Parker
Assistant Examiner — J. R. Oakley
(74) *Attorney, Agent, or Firm* — McClure, Qualey & Rodack, LLP

(57) **ABSTRACT**

An organic light emitting diode display and a manufacturing method thereof are provided. The organic light emitting diode display includes a first substrate, a second substrate, a plurality of organic light emitting diodes, and a frit layer. The organic light emitting diodes are disposed on the first substrate, and the frit layer adheres the first substrate and the second substrate to each other. The frit layer includes a first porous region having pores, a second porous region having pores, and a third porous region having pores. The number of the pores of the first porous region with a diameter of larger than or equal to 4 μm and smaller than or equal to 15 μm is greater than the number of the pores of the second porous region with the above-mentioned diameter range.

18 Claims, 5 Drawing Sheets



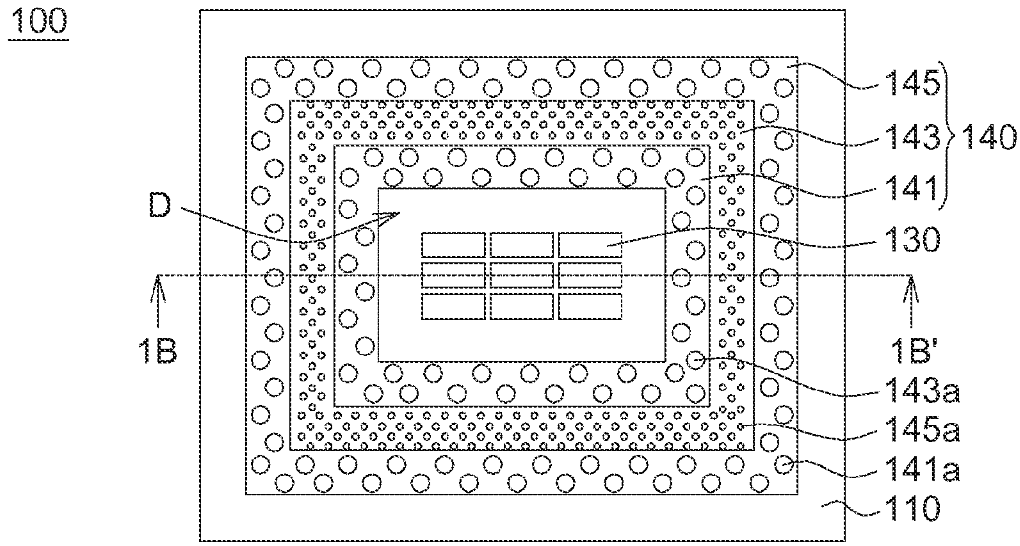

100
145
143
140
141
D
130
1B
1B'
143a
145a
141a
110

FIG. 1A

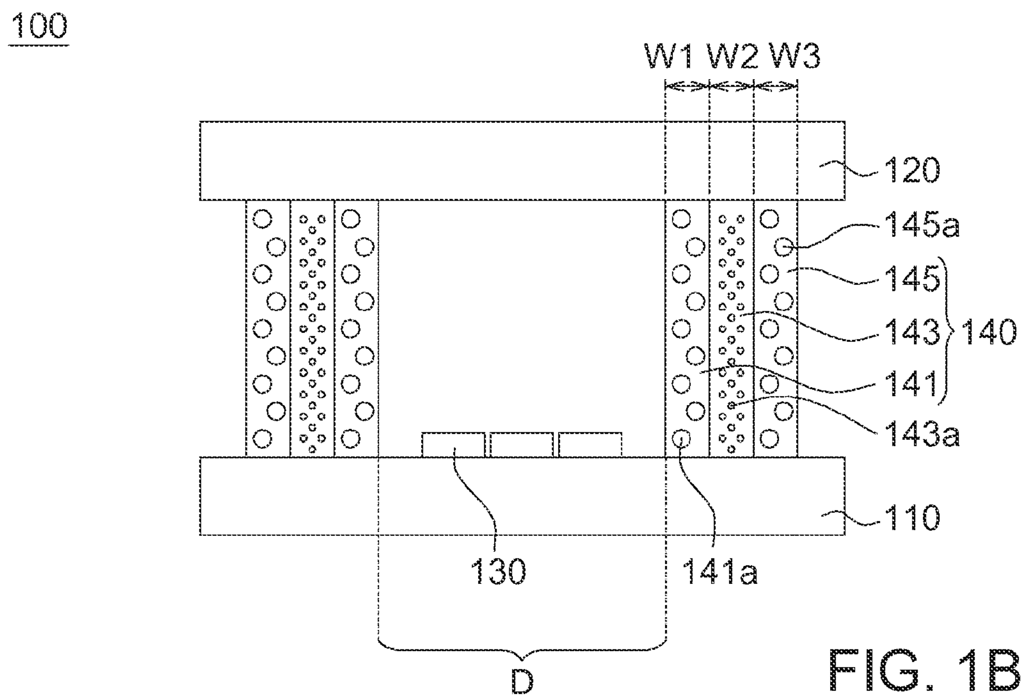

100
W1 W2 W3
120
145a
145
143
140
141
143a
110
130
141a
D

FIG. 1B

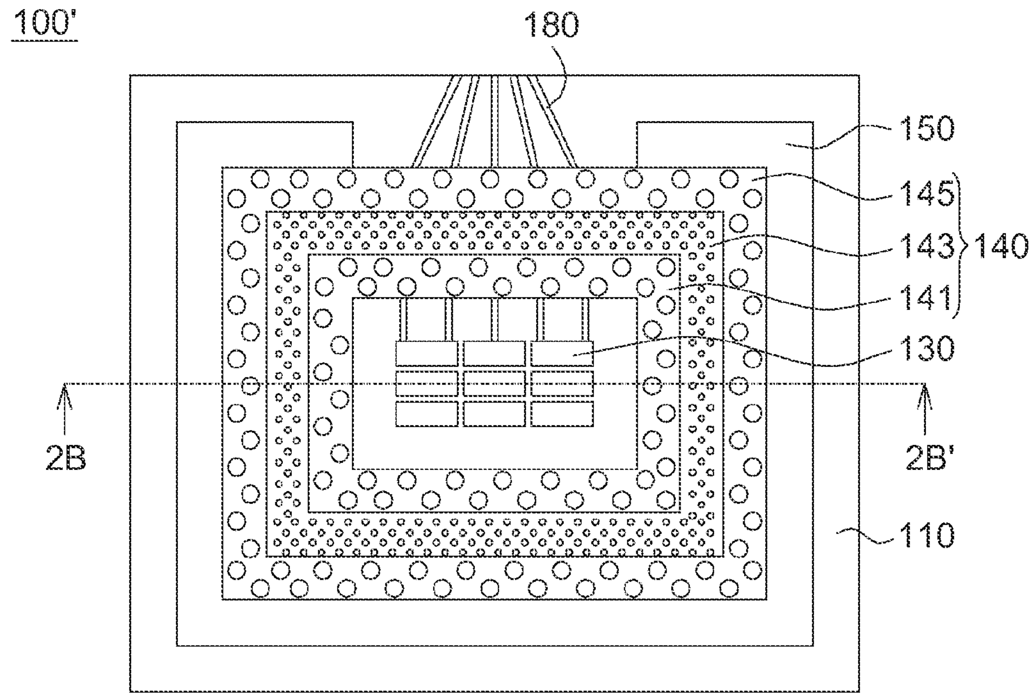

100'
180
150
145
143
140
141
130
2B
2B'
110

FIG. 2A

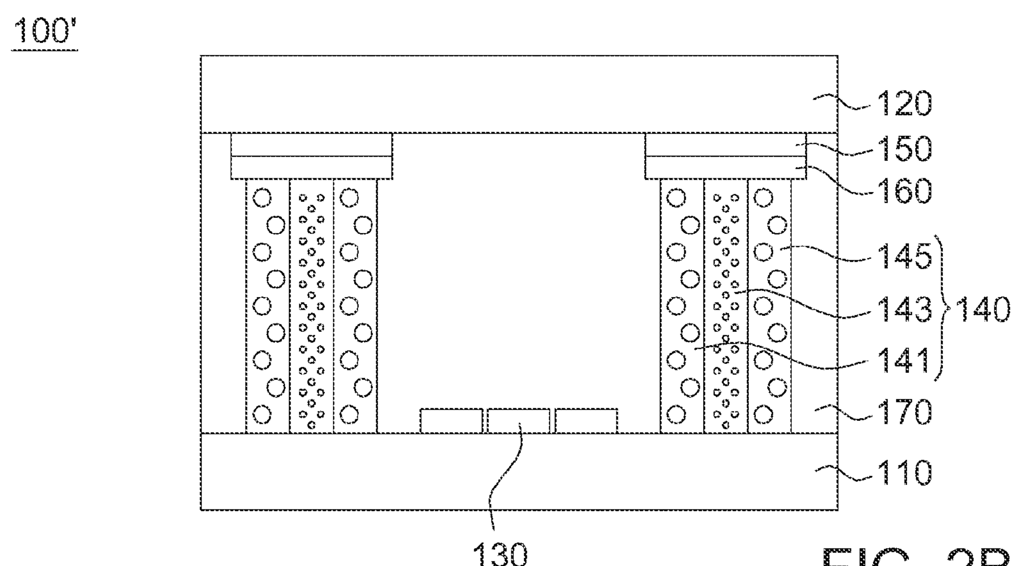

100'
120
150
160
145
143
140
141
170
110
130

FIG. 2B

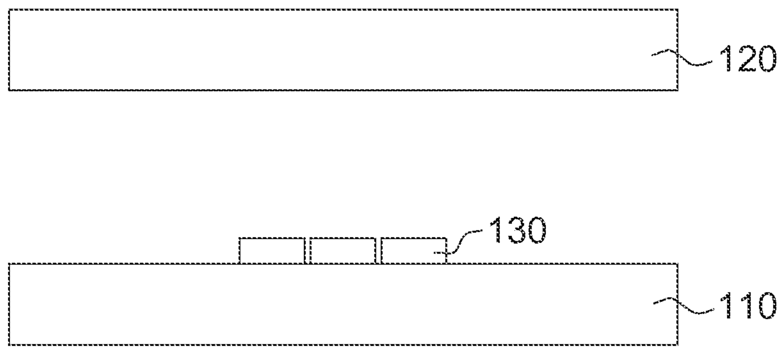


FIG. 3A

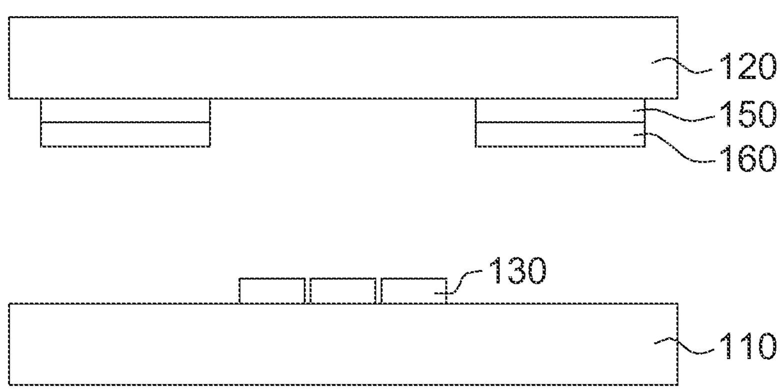


FIG. 3B

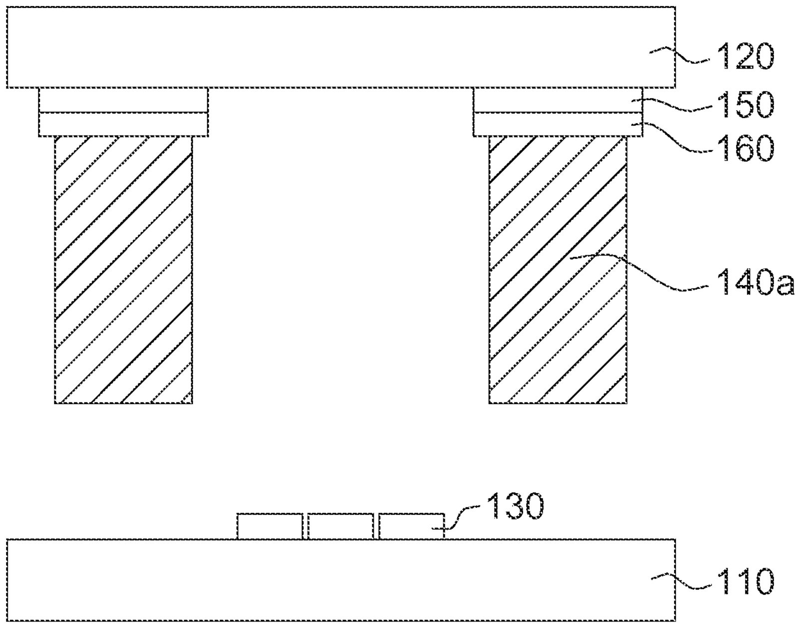


FIG. 3C

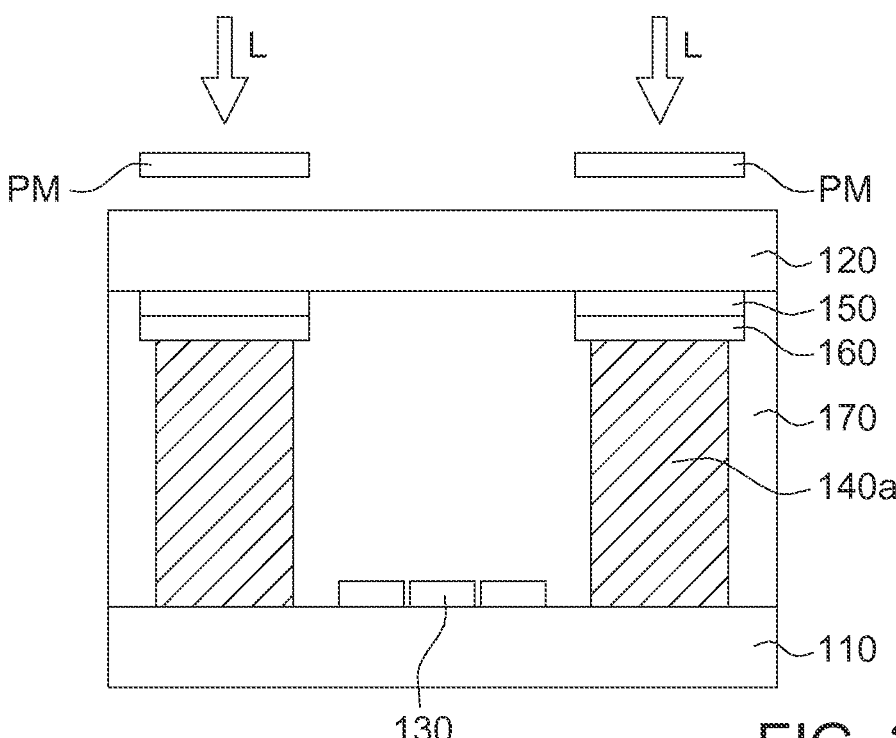
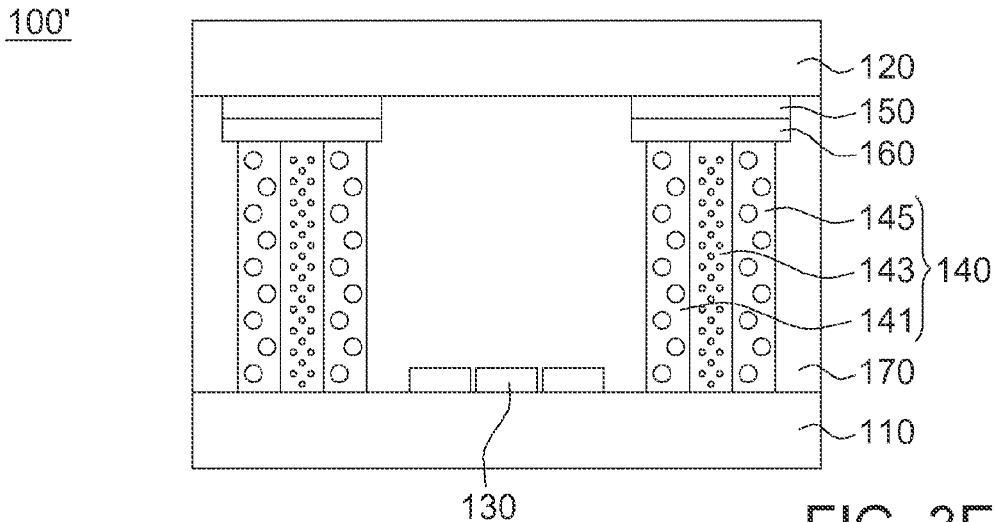
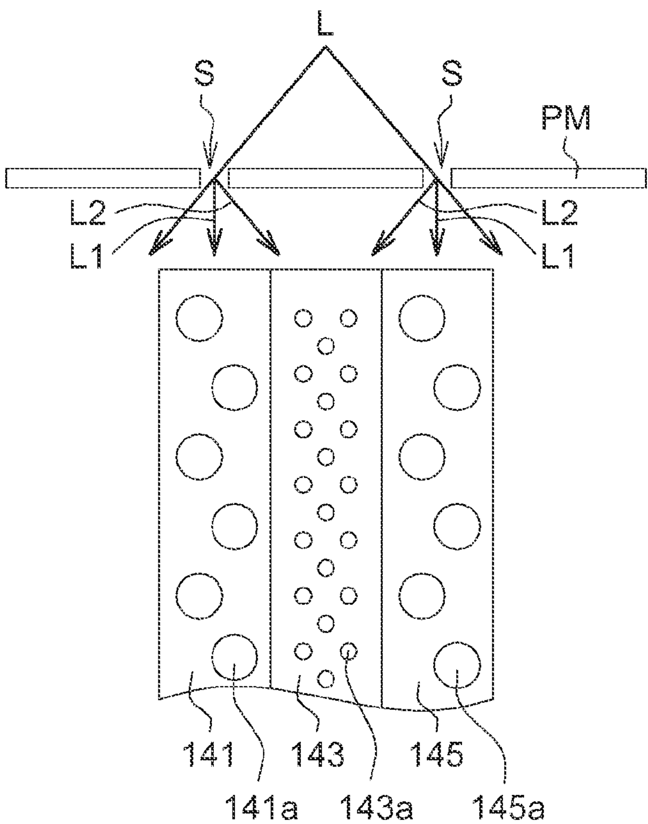


FIG. 3D



100'
120
150
160
145
143
140
141
170
110
130

FIG. 3E



L
S
S
PM
L2
L2
L1
L1
141
143
145
141a
143a
145a

FIG. 4

ORGANIC LIGHT EMITTING DIODE DISPLAY AND MANUFACTURING METHOD THEREOF

This application claims the benefit of People's Republic of China application Serial No. 201210394909.0, filed Oct. 17, 2012, the subject matter of which is incorporated herein by reference.

BACKGROUND

1. Technical Field

The invention relates in general to an organic light emitting diode display and a manufacturing method thereof, and particularly to an organic light emitting diode display comprising a frit layer having a porous structure and a manufacturing method thereof.

2. Description of the Related Art

Along with the advances of display technology, various types of display devices have been developed. Organic light emitting diode displays have become one of the most important research targets of display technology, and the requirements to the functions and characteristics of organic light emitting diode displays have gradually increased as well. However, organic light emitting diodes are very sensitive to moisture, and hence the performance and the service life thereof are easily influenced by external moisture. Therefore, researchers have been working on providing an organic light emitting diode display with excellent moisture-resisting abilities.

SUMMARY

The invention relates to an organic light emitting diode display and a manufacturing method thereof. In the organic light emitting diode display, with the "loose-dense-loose" structure formed from the first and the third porous regions having large pores and the second porous region having small pores and located between the first and the third porous regions, both moisture resistance and strain releasing can be achieved at the same time.

According to an embodiment of the present invention, an organic light emitting diode display is provided. The organic light emitting diode display comprises a first substrate, a second substrate, and a frit layer. The first substrate has a displaying area. The frit layer adheres the first substrate and the second substrate to each other. The frit layer comprises a first porous region and a second porous region disposed adjacent to the first porous region. The first porous region is disposed on the displaying area and located between the second porous region and the displaying area. The first porous region has a plurality of first pores with a diameter of larger than or equal to 4 μm and smaller than or equal to 15 μm. The number of the first pores with the diameter of larger than or equal to 4 μm and smaller than or equal to 15 μm is greater than the number of the pores of the second porous region with the diameter of larger than or equal to 4 μm and smaller than or equal to 15 μm.

According to another embodiment of the present invention, a manufacturing method of an organic light emitting diode display is provided. The manufacturing method of the organic light emitting diode display comprises the following steps: a first substrate having a displaying area and a second substrate are provided; a plurality of organic light emitting diodes are disposed on the first substrate; and a frit layer is formed for adhering the first substrate and the second substrate to each other. Forming the frit layer includes the following steps: a first porous region having a plurality of first pores with a diameter of larger than or equal to 4 μm and smaller than or equal to 15 μm is formed; and a second porous region is formed adjacent to the first porous region. The number of the first pores with the diameter of larger than or equal to 4 μm and smaller than or equal to 15 μm is greater than the number of the pores of the second porous region with the diameter of larger than or equal to 4 μm and smaller than or equal to 15 μm.

The above and other aspects of the disclosure will become better understood with regard to the following detailed description of the non-limiting embodiment(s). The following description is made with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1**A shows a top view of an organic light emitting diode display according to an embodiment of the present invention;

FIG. **1**B shows a cross-sectional view along the section line **1**B-**1**B' in FIG. **1**A;

FIG. **2**A shows a top view of an organic light emitting diode display according to another embodiment of the present invention;

FIG. **2**B shows a cross-sectional view along the section line **2**B-**2**B' in FIG. **2**A;

FIGS. **3**A-**3**E illustrate a process for manufacturing an organic light emitting diode display according to an embodiment of the present invention; and

FIG. **4** shows a partial schematic diagram of a laser beam passing through a patterned mask for forming a frit layer according to an embodiment of the present invention.

DETAILED DESCRIPTION

In the embodiments of the present disclosure, an organic light emitting diode display and a manufacturing method thereof are provided. In the organic light emitting diode display, with the "loose-dense-loose" structure formed from the first and the third porous regions having large pores and the second porous region having small pores and located between the first and the third porous regions, both moisture resistance and strain releasing can be achieved at the same time. The following embodiments are for the purpose of elaboration only, not for limiting the scope of protection of the invention. Detailed structures and processes may be modified or changed by one skilled in the art after having the benefit of this description of the disclosure.

FIG. **1**A shows a top view of an organic light emitting diode display according to an embodiment of the present invention, and FIG. **1**B shows a cross-sectional view along the section line **1**B-**1**B' in FIG. **1**A. Referring to FIGS. **1**A-**1**B, the organic light emitting diode display **100** includes a first substrate **110**, a second substrate **120**, one or more than one organic light emitting diode **130**, and a frit layer **140**. The first substrate **110** has a displaying area D. The organic light emitting diode **130** is disposed on the first substrate **110**. The frit layer **140** adheres the first substrate **110** and the second substrate **120** to each other. The frit layer **140** includes a first porous region **141**, a second porous region **143**, and a third porous region **145**. The first porous region **141** is disposed adjacent to the displaying area D, and the first porous region **141** is disposed between the second porous region **143** and the displaying area D. The first porous region **141** has a plurality of first pores **141**a with a diameter of larger than or equal to 4 μm and smaller than or equal to 15 μm. The second porous region **143** has a plurality of second pores **143**a with a diameter of larger than or equal to 0.2 μm and smaller than or equal to 4 μm. The third porous region **145** is located on an outermost side of the frit layer **140**, and the second porous region **143** is located between the first porous region **141** and the third porous region **145**. The third porous region **145** has a plurality of third pores **145*a*** with the diameter of larger than or equal to 4 μm and smaller than or equal to 15 μm.

As shown in FIGS. **1A-1B**, the frit layer **140** is formed between the first substrate **110** and the second substrate **120** and surrounding the organic light emitting diodes **130**. In the embodiment, the material of the frit layer **140** comprises, for example, a silicon-containing material with excellent moisture resistance properties. The first substrate **110** and the second substrate **120** are such as glass substrates. Similar to the frit layer **140**, the first substrate **110** and the second substrate **120** comprise a silicon-containing material. Such homogeneity of materials provides excellent moisture resistance properties of the whole structure after the substrates **110**, **120** and the frit layer **140** are adhered to each other. However, the material selections of the first substrate **110**, the second substrate **120**, and the frit layer **140** are depending on the conditions applied and are not limited to the materials aforementioned.

The material of the frit layer **140** includes a silicon-containing material, which provides excellent moisture resistance. However, after the frit layer **140** is heated to be adhered to glass substrates (e.g. the first substrate **110** and the second substrate **120**), it may deform or even crack under the strain. Once the frit layer **140** is deformed or cracked, the moisture resistance of the whole structure is largely reduced. In the embodiment, the first porous region **141** and the third porous region **145** are located on the two sides of the second porous region **143**, and the number of the pores **141*a*** and **145*a***, which have diameters of larger than or equal to 4 μm and smaller than or equal to 15 μm, of the first porous region **141** and the third porous region **145** is greater than the number of the pores with the above-mentioned diameter range (4-15 μm) of the second porous region **143**. In addition, the number of the pores, which have diameters of larger than or equal to 0.2 μm and smaller than or equal to 4 μm, of the second porous region **143** is larger than the pores with the above-mentioned diameter range (0.2-4 μm) of the first porous region **141** and the third porous region **145**. As such, the pores with large diameters of the first porous region **141** and the third porous region **145** may release the strain effectively, reducing the deformation and cracking of the whole structure under strain. In other words, the first porous region **141** and the third porous region **145**, having large pores, located on two sides may be regarded as loose springs, and the second porous region **143**, having small pores, located in the middle may be regarded as a tight spring. Accordingly, the frit layer **140** as a whole has a "loose-dense-loose" structure and is provided with a better strain releasing effect, compared to a conventional spring structure with single tension condition.

The porous structure of the frit layer **140** can release the strain effectively and reduce the deformation and cracking when the whole structure is under strain. However, too many pores make the whole structure less dense to an unacceptable level, resulting in decreasing the strain releasing effect, while too few pores make the strain releasing effect decrease. In the embodiment, the number of the pores with diameters of larger than or equal to 4 μm and smaller than or equal to 15 μm of the first porous region **141** and the third porous region **145** is greater than the number of the pores with the above-mentioned diameter range (4-15 μm) of the second porous region **143**, and the number of the pores with diameters of larger than or equal to 0.2 μm and smaller than or equal to 4 μm of the second porous region **143** is greater than the pores with the above-mentioned diameter range (0.2-4 μm) of the first porous region **141** and the third porous region **145**. As such, the small pores of the second porous region **143** provide a dense structure of the second porous region **143**, and thus excellent moisture resistance is maintained. In other words, the "loose-dense-loose" structure formed from the first porous region **141**, the second porous region **143**, and the third porous region **145** can achieve excellent moisture resistance t while the strain is effectively released at the same time.

As shown in FIG. **1B**, in a cross-section of the frit layer **140** along the section line **1B-1B'**, the first porous region **141** has a width W**1**, the second porous region **143** has a width W**2**, and the third porous region **145** has a width W**3**. In an embodiment, a ratio of the width W**2** of the second porous region **143** to the width (W**1**+W**2**+E**3**) of the frit layer **140** is, for example, 10-90%. In an alternative embodiment, the ratio of the width W**2** of the second porous region **143** to the width (W**1**+W**2**+E**3**) of the frit layer **140** is, for example, 25-35%, resulting in a better strain releasing effect.

In the embodiment, as shown in FIG. **1A**, the third porous region **145** surrounds the second porous region **143**, the second porous region **143** surrounds the first porous region **141**, and the first porous region **141** surrounds the organic light emitting diodes **130**.

In the embodiment, the frit layer **140** surrounding the organic light emitting diodes **130** has, for example, a square hollow structure, and the corner portion of such square hollow structure has a greater density of pores. Since the corner portion is usually under a larger strain, with a greater density of pores, the strain releasing ability of the corner portion is hence improved.

In the embodiment, as shown in FIG. **1B**, the first porous region **141**, the second porous region **143**, and the third porous region **145** abut against the first substrate **110** and the second substrate **120**.

FIG. **2A** shows a top view of an organic light emitting diode display according to another embodiment of the present invention, and FIG. **2B** shows a cross-sectional view along the section line **2B-2B'** in FIG. **2A**. Referring to FIGS. **2A-2B**, the organic light emitting diode display **100'** includes the first substrate **110**, the second substrate **120**, one or more than one organic light emitting diode **130**, and the frit layer **140**. The structures, arrangements, and function theories of the above-mentioned elements are similar to those with the same labeling in FIGS. **1A-1B** and are not repeated there. The differences of the present embodiment from the previous embodiment are described below.

As shown in FIGS. **2A-2B**, in the embodiment, the organic light emitting diode display **100'** may include a metal layer **150** and a fan out wire structure **180**. The fan out wire structure **180** and the metal layer are disposed between the frit layer **140** and the second substrate **120**. The fan out wire structure **180** is electrically connected to the organic light emitting diodes **130**. The metal layer **150** is electrically isolated from other electronic components. As shown in FIG. **2A**, the fan out wire structure **180** is located below a portion of the frit layer **140**, while the metal layer **150** is located below the left portion of the frit layer **140**.

In a manufacturing process for adhering the first substrate **110** and the second substrate **120** with the frit layer **140** by heating by a laser beam, the fan out wire structure **180** below the frit layer **140** reflects the laser beam, such that the heating efficiency of the portion of the frit layer **140** located above the fan out wire structure **180** is higher than the left portion of the frit layer **140**. In the embodiment, the metal layer **150** is disposed below the left portion of the frit layer **140** where the fan out wire structure is not disposed. As such, the whole area below the whole frit layer **140** is disposed with metal (including the fan out wire structure **180** and the metal layer **150**), such that the heating efficiency of the whole frit layer **140** in the heating process by the laser beam is uniform.

As shown in FIGS. **2A-2B**, in the embodiment, the organic light emitting diode display **100'** may include a metal nitride layer **160** disposed between the frit layer **140** and the metal layer **150**. The metal nitride layer **160** can increase the adhesion between the frit layer **140** and the metal layer **150**.

As shown in FIG. **2B**, in the embodiment, the organic light emitting diode display **100'** may further include an encapsulation layer **170** disposed between the first substrate **110** and the second substrate **120**. The encapsulation layer **170** surrounds and covers the frit layer **140**. The encapsulation layer **170** can increase the moisture resistance of the whole device.

The embodiments disclosed below are for elaborating a manufacturing method of an organic light emitting diode display according to an embodiment of the invention. However, the descriptions disclosed in the embodiments of the disclosure such as detailed manufacturing procedures are for illustration only, not for limiting the scope of protection of the disclosure. Referring to FIGS. **3A-3E**, which illustrate a process for manufacturing an organic light emitting diode display according to an embodiment of the invention.

Referring to FIG. **3A**, the first substrate **110** and the second substrate **120** are provided, and one or more than one organic light emitting diode **130** is disposed on the first substrate **110**.

Referring to FIG. **3B**, the metal layer **150** may be formed on the second substrate **120**, optionally. In the embodiment, the metal layer **150** is formed, for example, between the frit layer, which will be formed in the following process, and the second substrate **120**.

Referring to FIG. **3B**, the metal nitride layer **160** may be formed on the metal layer **150**, optionally. In the embodiment, the metal nitride layer **160** is formed, for example, between the frit layer **140**, which will be formed in the following process, and the metal layer **150**.

Referring to FIGS. **3C-3E**, the frit layer **140** is formed for adhering the first substrate **110** and the second substrate **120** to each other. As shown in FIG. **3E**, the manufacturing method of forming the frit layer **140** includes, for example: forming the first porous region **141**, forming the second porous region **143** adjacent to the first porous region **141**, and forming the third porous region **145** adjacent to the second porous region **143**, the second porous region **143** being located between the first porous region **141** and the third porous region **145**. The first porous region **141** has the first pores **141***a* with diameters of larger than or equal to 4 μm and smaller than or equal to 15 μm. The second porous region **143** has the second pores **143***a* with diameters of larger than or equal to 0.2 μm and smaller than or equal to 4 μm. The third porous region **145** has the third pores **145***a* with diameters of larger than or equal to 4 μm and smaller than or equal to 15 μm.

In an embodiment, the steps of forming the first porous region **141**, forming the second porous region **143**, and forming the third porous region **145** are carried out simultaneously. In the embodiment, the frit layer **140** is formed, for example, between the first substrate **110** and the second substrate **120** and surrounds the organic light emitting diodes **130**.

In the embodiment, the manufacturing method of forming the frit layer **140** includes such as the following steps. As shown in FIG. **3C**, a frit material layer **140***a* is formed on the second substrate **120**. In an embodiment, the frit material layer **140***a* is formed on the metal layer **150** and the metal nitride layer **160**. Next, the frit material layer **140***a* is preheated. In the embodiment, the frit material layer **140***a* is preheated at a temperature of, for example, 460-500° C. The frit material layer **140***a* is preheated to be coagulated on the surface of the second substrate **120**, such that the frit material layer **140***a* will not overflow when the second substrate **120** is flipped over in the following assembling process.

Next, as shown in FIG. **3D**, the first substrate **110** and the second substrate **120** are assembled, and the frit material layer **140***a* is heated to form the frit layer **140** adhering the first substrate **110** and the second substrate **120** to each other. In the embodiment, the frit material layer **140***a* is heated by, such as, the laser beam L to form the frit layer **140**. In the embodiment, the frit material layer **140***a* is heated by the laser beam L at a temperature higher than the preheating temperature. In the embodiment, the frit material layer **140***a* comprises a silicon-containing material, and the first substrate **110** and the second substrate **120** are glass substrates. When the heating treatment is carried out by the laser beam L, the homogeneity of the materials of the frit material layer **140***a*, the first substrate **110**, and the second substrate **120** causes the three layers turn into a melting state as heated, and therefore, the frit material layer **140***a* perfectly adheres the first substrate **110** and the second substrate **120** to each other, and the whole structure after adhering has excellent moisture resistance.

In the embodiment, the energy of the laser beam L is higher when the laser beam L is irradiated on the first porous region **141** and on the third porous region **145**, and the energy of the laser beam L is lower when the laser beam L is irradiated on the second porous region **143**, such that the average pore size of the pores of the first porous region **141** and the third porous region **145** is larger, and the average pore size of the pores of the second porous region **143** is smaller. In an embodiment, the laser beam L may include a plurality of laser pulses continuously irradiated on the frit material layer **140***a*.

In an embodiment, as shown in FIG. **3D**, the frit material layer **140***a* may be heated by the laser beam L passing through a patterned mask PM to form the first porous region **141**, the second porous region **143**, and the third porous region **145**, as shown in FIG. **3D**. In an embodiment, the patterned mask PM may have a plurality of slits (referring to FIG. **4**), and the laser beam L passes the slits to heat the frit material layer **140***a*.

FIG. **4** shows a partial schematic diagram of a laser beam passing through a patterned mask for forming a frit layer according to an embodiment of the present invention. As shown in FIG. **4**, each patterned mask PM has, for example, two slits S, and the locations of the two slits S are corresponding to the predetermined positions of the first porous region **141** and the second porous region **143**, respectively. The laser beam L passes through the two slits S and is divided into a plurality of laser beams heating different regions of the frit material layer **140***a*, respectively, to form the frit layer **140**. As shown in FIG. **4**, the laser beam L**1** irradiates on the first porous region **141** and the third porous region **145**. Since the travelling path of the laser beam L**1** is shorter, making the irradiation energy larger, and the temperature of the laser sintering is higher, as such, the pores of the first porous region **141** and the third porous region **145** have a larger size. In contrast, the laser beam L**2** irradiates on the second porous region **143**. Since the travelling path of the laser beam L**2** is longer, making the irradiation energy smaller, and the temperature of the laser sintering is lower, as such, the pores of the second porous region **143** have a smaller size.

Next, as shown in FIG. **3E**, the encapsulation layer **170** may be formed between the first substrate **110** and the second substrate **120**, optionally. The encapsulation layer **170** covers the frit layer **140**. As such, the organic light emitting diode display **100'** as shown in FIG. **3**E is formed.

While the disclosure has been described by way of example and in terms of the exemplary embodiment(s), it is to be understood that the disclosure is not limited thereto. On the contrary, it is intended to cover various modifications and similar arrangements and procedures, and the scope of the appended claims therefore should be accorded the broadest interpretation so as to encompass all such modifications and similar arrangements and procedures.

What is claimed is:

1. A display, comprising:
- a first substrate having a displaying area;
- a second substrate;
- a plurality of organic light emitting diodes disposed between the first substrate and the second substrate;
- a frit layer disposed between the first substrate and the second substrate and surrounding the organic light emitting diodes, wherein the frit layer comprises:
- a first porous region having pores and a second porous region having pores, wherein the first porous region and the second porous region are disposed adjacent to each other, and the first porous region is disposed adjacent to the displaying area and located between the second porous region and the displaying area; and
- an encapsulation layer disposed between the first substrate and the second substrate, wherein the encapsulation layer surrounds and covers the frit layer, and the frit layer is disposed between the organic light emitting diodes and the encapsulation layer;
- wherein, the number of the pores of the first porous region with a diameter of larger than or equal to 4 μm and smaller than or equal to 15 μm is greater than the number of the pores of the second porous region with the diameter of larger than or equal to 4 μm and smaller than or equal to 15 μm; and
- wherein a corner portion of the frit layer has a greater density of pores than a straight portion of the frit layer.

2. The display according to claim **1**, wherein the number of the pores of the second porous region with a diameter of larger than or equal to 0.2 μm and smaller than or equal to 4 μm is greater than the number of the pores of the first porous region with the diameter of larger than or equal to 0.2 μm and smaller than or equal to 4 μm.

3. The display according to claim **1**, wherein the frit layer further comprises a third porous region disposed on an outermost side of the frit layer, and the second porous region is located between the first porous region and the third porous region.

4. The display according to claim **3**, wherein the third porous region has pores, and the number of the pores of the third porous region with the diameter of larger than or equal to 4 μm and smaller than or equal to 15 μm is greater than the number of the pores of the second porous region with the diameter of larger than or equal to 4 μm and smaller than or equal to 15 μm.

5. The display according to claim **4**, wherein the number of the pores of the third porous region with the diameter of larger than or equal to 4 μm and smaller than or equal to 15 μm is greater than the number of the pores of the first porous region with the diameter of larger than or equal to 4 μm and smaller than or equal to 15 μm.

6. The display according to claim **1**, wherein along a cross-section of the frit layer, a ratio of the width of the second porous region to the width of the frit layer is between 10-90%.

7. The display according to claim **6**, wherein the ratio of the width of the second porous region to the width of the frit layer is between 25-35%.

8. The display according to claim **1**, further comprising a metal layer disposed between the frit layer and the second substrate.

9. The display according to claim **1**, wherein the frit layer comprises a silicon-containing material, and the first substrate and the second substrate are glass substrates.

10. The display according to claim **1**, wherein the organic light emitting diodes are disposed on the displaying area of the first substrate.

11. A manufacturing method of an organic light emitting diode display, comprising:
- providing a first substrate and a second substrate, the first substrate having a displaying area;
- forming a plurality of organic light emitting diodes on the displaying area of the first substrate and between the first substrate and the second substrate; and
- forming a frit layer between the first substrate and the second substrate for adhering the second substrate and the first substrate to each other and surrounding the organic light emitting diodes, wherein the step of forming the frit layer comprises:
- forming a first porous region having pores and a second porous region having pores, wherein the first porous region and the second porous region are disposed adjacent to each other, and the first porous region is disposed adjacent to the displaying area and located between the second porous region and the displaying area; and
- forming an encapsulation layer between the first substrate and the second substrate, wherein the encapsulation layer surrounds and covers the frit layer, and the frit layer is disposed between the organic light emitting diodes and the encapsulation layer;
- wherein, the number of the pores of the first porous region with a diameter of larger than or equal to 4 μm and smaller than or equal to 15 μm is greater than the number of the pores of the second porous region with the diameter of larger than or equal to 4 μm and smaller than or equal to 15 μm; and
- wherein a corner portion of the frit layer has a greater density of pores than a straight portion of the frit layer.

12. The manufacturing method of the organic light emitting diode display according to claim **11**, wherein the number of the pores of the second porous region with a diameter of larger than or equal to 0.2 μm and smaller than or equal to 4 μm is greater than the number of the pores of the first porous region with the diameter of larger than or equal to 0.2 μm and smaller than or equal to 4 μm.

13. The manufacturing method of the organic light emitting diode display according to claim **11**, wherein the step of forming the frit layer further comprises: forming a third porous region on an outermost side of the frit layer, the second porous region is located between the first porous region and the third porous region, and the first porous region, the second porous region, and the third porous region are formed simultaneously.

14. The manufacturing method of the organic light emitting diode display according to claim **13**, wherein the number of the pores of the third porous region with the diameter of larger than or equal to 4 μm and smaller than or equal to 15 μm is greater than the number of the pores of the second porous region with the diameter of larger than or equal to 4 μm and smaller than or equal to 15 μm.

15. The manufacturing method of the organic light emitting diode display according to claim 11, wherein the step of forming the frit layer comprises:

forming a frit material layer on the second substrate;

preheating the frit material layer;

assembling the first substrate and the second substrate; and

heating the frit material layer for forming the frit layer adhering the first substrate and the second substrate to each other.

16. The manufacturing method of the organic light emitting diode display according to claim 15, wherein the frit material layer is preheated at a temperature of 460-500° C.

17. The manufacturing method of the organic light emitting diode display according to claim 15, wherein the frit material layer is heated by a laser beam for forming the frit layer.

18. The manufacturing method of the organic light emitting diode display according to claim 17, wherein the frit material layer is heated by the laser beam passing through a patterned mask for forming the first porous region and the second porous region of the frit layer.

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